Citation:

Guevel MR, Sirot V, Volatier JL, Leblanc JC. A risk-benefit analysis of French high fish consumption: a QALY approach. *Risk Anal.* 2008 Feb;28(1):37-48.

PubMed ID: 18304105

Study Design:

Risk-Benefit / Meta-Analysis

Class:

M - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

The purpose of this risk-benefit analysis was to assess the relative risk of methylmercury (MeHg) intake versus the benefit of n-3 polyunsaturated fatty acid (PUFAs) intake on the CHD system (CHD mortality, stroke mortality and morbidity) and on prenatal cognitive development.

Inclusion Criteria:

Studies included in the development of the dose-response relationship:

- The evaluation of the impact of n-PUFAs intake and not only fish consumption
- The inclusion of subjects without cardiovascular diseases at baseline.

CALIPSO population:

- Adults 18 years and above living within a 20-25 km radius around four French coastal areas

Exclusion Criteria:

Not described.

Description of Study Protocol:

Recruitment:

Data used in this study were extracted from the CALIPSO study (fish and seafood consumption study and biomarker of exposure to trace elements, pollutants, and omega-3) conducted among French coastal populations. A representative consumer population sample of individuals was recruited randomly (apart from the quotas applied, which are not described) by door-to-door canvassing every five doors, using the so-called random route method.

This article considers the impact of change from a medium n-3 PUFAs intake (the first quintile of CALIPSO respondents) to a high intake (the last quintile of CALIPSO respondents).

Design: Risk-benefit / meta-analysis. The Quality-Adjusted Life Year (QALY) approach was used which modeled neurodevelopmental benefits and risks associated with DHA and MeHg. This analysis did not exhaustively address all effects associated with fish consumption, that is:

- For the risk part, it only considered the MeHg impact on cognitive development.
- For the benefit part, only the n-3 PUFAs impact on the cardiovascular system (CHD mortality, stroke mortality and morbidity) and on cognitive development were considered.

Blinding used (if applicable): not applicable

Intervention (if applicable): not applicable

Statistical Analysis

Three studies were used for modeling the impact of EPA-DHA intakes on CHD mortality and two for modeling the impact on stroke incidence. All of the studies were observational, and the observations were extracted from these studies and aggregated without weighting, in an initial approach.

Data Collection Summary:

Timing of Measurements

Not applicable.

Dependent Variables

- CHD mortality, stroke mortality, and morbidity
- Fetal neuronal development, in terms of IQ loss or gain

Independent Variables

- Change from medium to high n-3 PUFA intake

Control Variables

Description of Actual Data Sample:

Initial N: 5 studies included in establishing the dose-response: includes men and women, 34 years of age and older (approximately 226,000 respondents); other demographics or health status is not described.

Attrition (final N): 5 studies, 3 regarding CHD mortality and 2 regarding stroke incidence

Age: 34 years and older

Ethnicity:

Other relevant demographics: Demographics of the CALIPSO population are not reported

Anthropometrics:

Location: Studies published in the United States

Summary of Results:

Key Findings:

- Results show that increasing fish consumption may have a beneficial impact on health.
- However, the confidence interval of the overall estimation has a negative lower bound, which means that this increase in fish consumption may have a negative impact due to MeHg contamination

Fish and Seafood Consumption and MeHg Exposure of the CALIPSO Population

- The average EPA-DHA intake of the CALIPSO population was 391 mg/day
- The average MeHg exposure associated with fish was 0.76 micrograms/kg/body weight, per week
- Among the CALIPSO sub-population for the fifth quintile based on EPA-DHA intake, average intake was 2,700 mg/day EPA-DHA and 2.6 micrograms MeHg/kg/body weight, per week

Dose-Response Relationship for the Cardiovascular System

- For both CHD mortality and stroke incidence, the relative risk, confidence intervals, and p-values are displayed for three different shapes including linear, exponential, and loglinear.
- When EPA-DHA amounts are under the recommended daily intake, the loglinear model shows the best benefit, since the reduction in the relative risk is more significant; whereas with high amounts, it is the one that progresses the slowest with an asymptotic effect, which suggests a saturation of the biological ways for n-3 assimilation.
- The exponential model is initially close to the linear model, and then it seems to have the same asymptotic behaviors

Project Impacts, in Terms of QALY, of the Change from a Medium n-3 PUFAs Intake to a High Intake

- The change in consumption from a medium EPA-DHA intake to a high intake, seems to have a positive impact on the individual's quality of life (for both the cardiovascular system and the prenatal cognitive development), irrespective of the shape of the dose-response relationship used.
- According to these models, the DHA impacts would be more significant than the MeHg impact on intake and exposure levels of the studied population.
- The confidence intervals of the total QALY have a negative lower bound, which means that the change in consumption proposed by this scenario might not be beneficial for all individuals. It seems that the most uncertainty surrounds the MeHg impact on cognitive development.

Author Conclusion:

The authors note that these results are specific to the studied population, with its own intakes and exposures. Due to large discrepancies with similar analysis, the models used for cognitive

development inputs should be studied more carefully.

The dose-response relationship linking the relative risk of a disease and consumption might be the most sensitive aspect of this approach. The dose-response relationship developed in this analysis are based on very little aggregated data. Moreover, the studies from which these data are aggregated are not really equivalent.

Reviewer Comments:

From an evidence-based approach, theoretical assumptions appear to be made throughout this analysis (e.g., maternal MeHg and DHA intake are expressed in terms of the mother's age and IQ score). These findings may have limited generalizability to other populations (e.g., note reliance on 'extracted data on the French demographic situation.') The discussion illustrates numerous limitations of this risk-benefit analysis.

Research Design and Implementation Criteria Checklist: Review Articles

Relevance Questions		
1.	Will the answer if true, have a direct bearing on the health of patients?	Yes
2.	Is the outcome or topic something that patients/clients/population groups would care about?	Yes
3.	Is the problem addressed in the review one that is relevant to nutrition or dietetics practice?	Yes
4.	Will the information, if true, require a change in practice?	Yes

Validity Questions		
1.	Was the question for the review clearly focused and appropriate?	Yes
2.	Was the search strategy used to locate relevant studies comprehensive? Were the databases searched and the search termsused described?	No
3.	Were explicit methods used to select studies to include in the review? Were inclusion/exclusion criteria specified and appropriate? Were selection methods unbiased?	No
4.	Was there an appraisal of the quality and validity of studies included in the review? Were appraisal methods specified, appropriate, and reproducible?	No
5.	Were specific treatments/interventions/exposures described? Were treatments similar enough to be combined?	Yes
6.	Was the outcome of interest clearly indicated? Were other potential harms and benefits considered?	Yes

7.	Were processes for data abstraction, synthesis, and analysis described? Were they applied consistently across studies and groups? Was there appropriate use of qualitative and/or quantitative synthesis? Was variation in findings among studies analyzed? Were heterogeneity issued considered? If data from studies were aggregated for meta-analysis, was the procedure described?	No
8.	Are the results clearly presented in narrative and/or quantitative terms? If summary statistics are used, are levels of significance and/or confidence intervals included?	No
9.	Are conclusions supported by results with biases and limitations taken into consideration? Are limitations of the review identified and discussed?	Yes
10.	Was bias due to the review's funding or sponsorship unlikely?	Yes